

Cal/Ecotox

Exposure Factors for Least Tern (Sterna antillarum)*

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Endpoint Type	Endpoint Value	Error	Range	Units	Sex	Life Stage	Location	Note	Reference
Age at Fledging, Metamorphosis, Weaning	20			d	NR	Fledgling	Orange; CA	a	1
Age at Sexual Maturity	2			yr	B	Adult	Orange; CA	b	2
Age at Sexual Maturity	2			yr	NR	Adult	Los Angeles; CA	c	3
Body Weight - Mean	39.62	0.73 2SE		g	NR	Fledgling	Orange; CA	d	1
Body Weight - Mean	5.93	0.09 2SE		g	NR	Hatchling	Orange; CA	e	1
Clutch or Litter Size	2		1-3		F	Adult	Orange; CA	f	1
Clutch or Litter Size	2.33 (first wave), 1.70 (second wave)			eggs/clutch	F	Adult	Orange; CA	g	2
Clutch or Litter Size			1.38-2.1	eggs/clutch	F	Adult	MEXICO	h	4
Clutch or Litter Size			2-3	eggs/clutch	F	Adult	Orange; CA	i	5
Clutch or Litter Size	1.73		1-3	eggs/clutch	F	Adult	SC	j	6
Clutch or Litter Size	2.1-2.7			eggs/clutch	F	Adult	MT	k	7
Clutch or Litter Size			1.72-2.22	eggs/clutch	NR	Both Adult and Juv.	Orange; CA	l	8
Clutches or Litters per year	1				B	Adult	Orange; CA	m	1
Duration of Incubation or Gestation	22		20-25	d	NR	Embryo	Orange; CA	n	1
Fledging or Weaning Rate	0.50 (first wave), 0.58 (second wave)			fledglings/p air	NR	Fledgling	Orange; CA	o	2
Fledging or Weaning Rate	76.8	2.0 2SE		%	NR	Fledgling	TX	p	9
Fledging or Weaning Rate			24/88 to 104/112	fledglings/b reeding pairs	NR	Fledgling	TX	q	9
Fledging or Weaning Rate			7/16 to 63/58	fledglings/n ests	NR	Fledgling	MEXICO	r	4
Fledging or Weaning Rate	0.69		0.45-0.94	fledglings/p air	NR	Fledgling	CA	s	10
Fledging or Weaning Rate			0.4-1.7	fledglings/p air	NR	Fledgling	Los Angeles; CA	t	3
Fledging or Weaning Rate			0.45-0.94	fledglings/p air	NR	Fledgling	CA	u	3
Fledging or Weaning Rate	0.1-1.4			fledglings/n est	NR	Juvenile	MT	v	7
Foraging Distance			approx. 2 - >2	mi	NR	Adult	Los Angeles; Orange; CA	w	11
Hatching Success	0.79-1.31			eggs hatched/nest	NR	Chick	CT	x	12
Hatching Success			80-90	%	NR	Hatchling	Orange; CA	y	1
Hatching Success	100% (first wave), 82% (second wave)				NR	Hatchling	Orange; CA	z	2
Hatching Success			60.8-79.9	%	NR	Hatchling	Orange; CA	aa	8
Hatching Success			34.4-48.9	%	NR	Hatchling	MEXICO	ab	4
Longevity	9.63	6.55-14.48 95% CI		yr	NR	Adult	Los Angeles; CA	ac	3
Longevity	13			yr	NR	Adult	Los Angeles; CA	ad	3
Population Density	40			nests/1400 m^2	B	Adult	MEXICO	ae	4
Survival/ Mortality	0.88				NR	Adult	Los Angeles; CA	af	3
Survival/ Mortality	0.16				NR	Chick	Los Angeles; CA	ag	3
Survival/ Mortality	17/32 to 33/33				NR	Chick; Embryo	Los Angeles; Orange; CA	ah	13
Survival/ Mortality			11-33	%	NR	Hatchling	Orange; CA	ai	1

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Endpoint Type	Endpoint Value	Error	Range	Units	Sex	Life Stage	Location	Note	Reference
Survival/ Mortality			56-74	%	NR	Juvenile	Orange; CA	aj	8
Territory Size	40			cm	B	Adult	Orange; CA	ak	5
Time of Mating/ Laying	May-early Jul (first wave); late May-Aug (second wave)				B	Adult	Orange; CA	al	2
Time of Mating/ Laying	May to Aug				B	Adult	MEXICO	am	4
Time of Mating/ Laying	May-Jul				F	Adult	Orange; CA	an	1
Time of Migration or Dispersal	late Apr				B	Adult	Orange; CA	ao	1
Time of Migration or Dispersal	first two wks Apr				B	Both Adult and Juv.	Orange; CA	ap	1
Time of Migration or Dispersal	late Jul				NR	Both Adult and Juv.	Orange; CA	aq	11
Time of Migration or Dispersal	late Aug-Sep				NR	Both Adult and Juv.	Orange; CA	ar	8
Time of Molt	mid/late Jul-Sep				NR	Adult	TX	as	14
Time of Molt	May-Jul				NR	Adult	TX	at	14
Time of Nesting	June 16, June 30, July 1				B	Adult	MT	au	7

- Notes**
- a approximate age of fledging (first flight); N=2 birds; Sunset Aquatic Park, Huntington Beach
 - b age of birds nesting for the first time; N=10 pairs; NASA Island, Seal Beach National Wildlife Refuge
 - c earliest age at which adults were known to breed for the first time; N=186 birds; Venice (beach)
 - d asymptotic body weight of juveniles at 15 days of age; N=8 birds; Sunset Aquatic Park, Huntington Beach
 - e mean body weight of day 0 chicks; N=77 birds; Sunset Aquatic Park, Huntington Beach
 - f most frequent clutch size, 2 years; N= 96 nests; Sunset Aquatic Park, Huntington Beach
 - g average clutch sizes for early and late nesters; N=10 nests (first wave), 33 nests (second wave); NASA Island, Seal Beach National Wildlife Refuge
 - h range of average clutch sizes, 2 years; N=16-58 nests/year; Cuixmala Beach [19 deg, 22°14'N, 104 deg 59'31"W]
 - i N=12 clutches; Huntington Beach State Park; Eight nests had 3 eggs, 4 nests had 2 eggs.
 - j mean clutch size; N=396 clutches; Cape Romain National Wildlife Refuge
 - k range of clutch means over 3 years of study; N=6-18 clutches/study year; Yellowstone River
 - l range of average clutch sizes over 2 years; N=230-336 nests; Santa Margarita River at Camp Pendleton
 - m normal number of broods per year; N=NR; Sunset Aquatic Park, Huntington Beach; Santa Margarita Lagoon
 - n most frequent incubation period, 2 years; N=41 clutches; Sunset Aquatic Park, Huntington Beach
 - o mean number of fledglings produced per nesting pair; N=10 nests (first wave), 33 nests (second wave); NASA Island, Seal Beach National Wildlife Refuge; Success was considered moderate in both waves.
 - p estimated survival rate of banded juveniles; N=NR; Aransas and San Patricio Counties
 - q estimated fledgling production among 4 colonies; N=26-140 pairs/colony; Aransas and San Patricio Counties
 - r range of fledging rates, 2 years; N=16-58 nests/year; Cuixmala Beach [19 deg, 22°14'N, 104 deg 59'31"W]
 - s statewide average annual fledging rate, 13 years; N=832-1708 nesting pairs/year
 - t average number of fledglings produced per pair, over 13 years; N=35-165 pairs/year; Venice (beach)
 - u average number of fledglings produced per pair, over 13 years; N=775-1,264 pairs/year; statewide
 - v range of mean fledging success over 3 study years; N=6-18 nests/study year; Yellowstone River; Percent of successful nests versus total nests varied from 63.6% to 100%.
 - w foraging distance from nesting sites; N=10-11 surveys/site; May, Jun, Jul; Venice Beach, Huntington Beach, Santa Margarita River
 - x mean hatching success during two years of study; N=545-606 nests per study year; April-August; Sandy Point, West Haven
 - y range of hatching success, 2 years; N=53-157 eggs/year; Sunset Aquatic Park, Huntington Beach
 - z proportions of eggs hatched of eggs laid; N=54 eggs (second wave); NASA Island, Seal Beach National Wildlife Refuge
 - aa proportion of eggs hatched of total eggs laid over 2 years; N=419-734 eggs; Santa Margarita River at Camp Pendleton
 - ab range of egg hatching rates, 2 years; N=16-58 nests/year; Cuixmala Beach [19 deg, 22°14'N, 104 deg 59'31"W]
 - ac expected number of breeding years per adult bird; N=372 birds; Venice (beach); Expected survival was 4.97 years for years in which the El-Nino Southern Oscillation occurred.
 - ad age of oldest banded breeding birds; N=40-105 birds/year; Venice (beach); Number is based on 7 years of surveys at Venice Beach breeding area.
 - ae density of nests at one colony; N=1 colony; Cuixmala Beach [19 deg, 22°14'N, 104 deg 59'31"W]
 - af overall survival rate for adults that have returned to breed once; N=82-165 breeding pairs/year; Venice (beach); See citation for table of age-dependent survival rates, based on banded birds returning to breed.

ag	rate at which chicks survived to breed at least once; N=84-285 chicks/year; Venice (beach)
ah	range of numbers of clutches lost of total numbers of clutches in a colony; N=7 colonies, 8 years; coast; Incidence of large scale predation occurred 4 times in 7 colonies, over 8 years.
ai	proportion of hatched birds that survived during post-fledging period, 2 years; N=42-140 hatched birds/year; Sunset Aquatic Park, Huntington Beach
aj	estimated annual mortality rate for two years based on juvenile censuses; N=92-195 birds counted; Santa Margarita River at Camp Pendleton; This is probably an overestimate of true mortality due to census error.
ak	radius of nesting territory; N=NR; Huntington Beach State Park
al	nesting periods of early (first wave) and late (second wave) birds; N=8-10 pairs (first wave), 29 pairs (second wave); NASA Island, Seal Beach National Wildlife Refuge
am	beginning to end of nesting period; N=1 colony; Cuixmala Beach [19 deg, 22'14"N, 104 deg 59'31"W]
an	period of egg laying, 2 years; N=2 colonies; Sunset Aquatic Park, Huntington Beach
ao	time of arrival at breeding grounds; N=2 colonies; Sunset Aquatic Park, Huntington Beach; Santa Margarita Lagoon
ap	timing of dispersal from breeding areas; N=1 colony; Sunset Aquatic Park, Huntington Beach
aq	timing of post-fledging dispersal; N=NR; Jul; Santa Margarita River; Family groups moved to a freshwater lake about 5 miles inland from nesting area.
ar	timing of departure from breeding areas; N=4 nesting areas, 2 years; Santa Margarita River at Camp Pendleton
as	timing of pre-basic molt; N=NR; coastal areas
at	timing of primary molt; N=190 birds; coastal areas
au	mean nest-initiation dates over 3 years of study; N=6-17 nests/study year; Yellowstone River

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